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(54) Cartridge for containing a pressurised fluid.

(57) The present invention relates to a cartridge for holding at least one charge of pressurised fluid therein and formed to allow the selecive release of the pressurised fluid into a beverage in a container in which the cartridge is placed. The cartridge is provided with at least one aperture (10) in a wall thereof which allows the entry and/or exit of the pressurised fluid and is improved by the provision in the chamber (8) formed in the cartridge of a cavity (12) which connects the aperture to the chamber and this allows the control of the characteristic of the pressurised fluid to be controlled. In a further aspect three is provided a cartridge having resilient members (20) depending therefrom which serve to locate the cartridge in the container and a method for forming a cartridge is also disclosed.

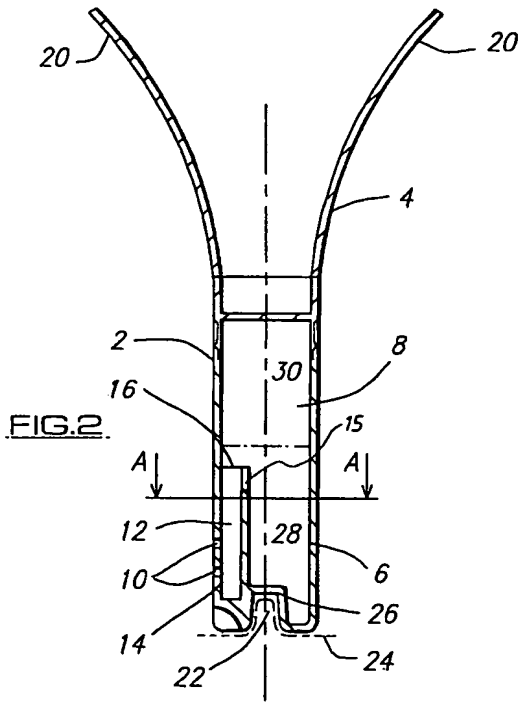

FIG.2

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This invention relates to a cartridge for use in conjunction with a container which is provided with contents in the form of a carbonated beverage. The cartridge is provided in the interior of the container and can be charged with a quantity of pressurised fluid and allows the selective release of the same into the carbonated beverage.

There are at present several cartridges available for use in containers in the form of cans and in particular in cans which contain carbonated alcoholic beverages such as beer. The conventional cartridges are charged with a pressurised fluid such that when the can is opened for consumption of the contents the pressurised fluid in the cartridge is released into the beer and creates a foaming effect which causes the beer to have the appearance and taste of beer poured from a draught tap which is perceived to be an improved form of providing the beer.

Typically the conventional cartridge is placed in the can, the can filled with the beer and the can sealed. The can is pasteurised and the heat of pasteurisation causes the pressure of the beer to increase and some of the beer enters the cartridge through a small aperture therein and forms the pressurised fluid. The can and contents are then flush cooled which reduces the pressure of the beer and creates a pressure differential between the beer in the can and the fluid in the cartridge. The differential is not sufficient to allow the pressurised fluid to leave the cartridge through the aperture so that it remains in a pressurised state relative to the beer. When the can is opened for the consumption of the contents the pressure of the beer is reduced and the pressure differential between the beer and the pressurised fluid in the cartridge increase to a sufficient extent to cause the pressurised fluid to exit into the beer via the aperture in the cartridge and cause the foaming effect in the beer to occur.

In the conventional cartridges the pressurised fluid is a mixture of gas and liquid and the presence of the liquid tends to dilute the foaming effect of the pressurised fluid. Furthermore the ratio of liquid and gas in the pressurised fluid in the cartridge is only controllable by the control of the filling process and the fluid pressure. The cartridges are not provided with control features and therefore the performance of each cartridge cannot be easily predicted.

Another problem with conventional cartridges is that they are typically placed in and secured to the base of the can by plastics inserts which serve to wedge the cartridge in the base of the can. However, the cartridges of this sort can only be used in containers which have wide openings so that the cartridge can be placed into the can before the same is sealed. These conventional cartridges cannot be used in bottles as they cannot be passed through the neck of the bottle and, particularly in relation to plastic bottles, the bottles cannot be subjected to pasteurisation for charging of the cartridge due to the possibility of damage to the bottle due to the heat created. One type of cartridge is designed for use in bottles and this comprises a cartridge with an upwardly extending portion which has formed therein a neck ring. In order to secure the neck ring and cartridge in position in the bottle the neck ring is expanded to contact and locate with the necked portion of the bottle. This arrangement depends upon the neck ring being retained in engagement with the neck of the bottle for the cartridge to be maintained in the correct position. If this fails the cartridge is then loose in the bottle which is undesirable.

The aims of the present invention are to provide a cartridge for issuing a pressurised fluid into a carbonated beverage held in a container, said container provided with a cartridge which is charged with a pressurised fluid, the composition of which can be determined by the dimensions of the cartridge and which can if required be provided with engagement means which allow the cartridge to be securely located in the container. A still further aim is to provide a method of inserting the cartridge into a container such as a bottle.

In a first aspect of the invention there is provided a cartridge adapted to contain a pressurised fluid in a chamber therein, said cartridge provided for operation in a container for a carbonated beverage and adapted for the selected release of the pressurised fluid into the beverage, said cartridge having, in a wall thereof, at least one aperture to allow the entry and/or exit of pressurised fluid into the chamber and characterised in that the aperture opens into a cavity defined by walls inside the chamber and in which there is provided an opening in connection with the chamber of the cartridge.

A cartridge of this form allows the composition of the pressurised fluid discharged into the beverage to be predetermined by determining the position of the opening of the cavity in relation to the chamber so that, if required, only the gas portion of the pressurised fluid can exit into the cavity via the opening and into the beverage to create a maximum foaming effect or the effect can be diluted to suit by positioning the opening into the cavity to allow a quantity of pressurised liquid to be emitted along with the gas.

Preferably the dimension of the opening into the chamber is larger than the aperture in the wall of the cartridge.

In one embodiment the cartridge is substantially cylindrical in shape and the cavity depends substantially from the base of the chamber to depend substantially upwardly from the aperture in

the wall so that the pressurised fluid is required to pass through the cavity when entering and exiting the chamber. In one embodiment apertures are provided in the side walls and/or the base of the cartridge.

Typically the cavity depends upwardly from the aperture provided in the base or side walls such that the position of the opening from the cavity into the chamber determines the composition of the pressurised fluid emitted from the cartridge in terms of proportion of liquid and gas.

In one embodiment the position of the opening in the cavity is such that the same lies in the area of the chamber filled with gas only such that the pressurised fluid emitted from the cartridge is gas only. In an alternative embodiment the opening is positioned such that it lies within the part of the chamber filled with liquid such that the pressurised fluid emitted from the cartridge comprises the liquid lying above the opening and the gas in the chamber. Hence the positioning of the opening in the chamber relative to the level of liquid in the same allows the composition of the pressurised fluid emitted from the cartridge to be controlled.

In a preferred embodiment the cartridge is provided with a plurality of resilient members depending therefrom such that when the cartridge is placed in the container the members contact with the walls of the container to maintain the cartridge in the desired position therein.

In one embodiment the container is a bottle with a necked opening and the members are sufficiently flexible to allow the same to be flexed inwardly to allow entry of the cartridge into the container through the necked opening. Typically there is a first set of members provided to contact the upper walls of the container and optionally a second set adapted to contact with the base of the container. Alternatively, or additionally the cartridge is locatable on a location means formed on the container and preferably in the base thereof.

The chamber or cavity of the cartridge may also contain a substance inserted prior to the pressurised fluid which colours and/ or flavours the beverage when introduced into the beverage along with the pressurised fluid.

In one embodiment the cartridge is formed from two parts, one of which includes the cavity depending in relation with at least one aperture formed in the wall of the same.

In one embodiment when the pressurised fluid is charged into the cartridge the at least one exit aperture for the same is sealed in a closed state. In one embodiment the aperture is sealed with a membrane applied thereover which can be gelatine based. In an alternative embodiment the aperture is held in a sealed condition by a valve assembly provided in the cartridge. Typically the said membrane or valve assembly is provided in a form such that when the pressure differential between the pressurised fluid in the cartridge and the beverage increases upon, for example, the opening of the container, the aperture is opened by either the membrane breaking or the valve moving away from the aperture or apertures. The cartridge can be manufactured from any suitable plastics material or alternatively from aluminium and, when manufactured from aluminium, the cartridge is of sufficient weight to allow the same to be located across the corners of a container such as a can.

In a further aspect of the invention there is provided a cartridge adapted to contain a pressurised fluid, said cartridge provided in the interior of a container for a carbonated beverage and said cartridge adapted for the selected release of the pressurised fluid into the beverage from an interior chamber characterised in that the cartridge is provided with a plurality of resilient members depending therefrom such that when the cartridge is placed in the container the members contact with the walls of the container to maintain the cartridge in the desired position therein.

The provision of resilient members on the cartridge allows the cartridge to be securely positionable in a container and, as the members are resilient they can be flexed inwardly to allow the cartridge to be placed into a container having a relatively narrow opening such as, for example, a bottle. This is not possible with most conventional cartridges.

Typically the container is a bottle with a necked opening and the members are sufficiently flexible and resilient to allow the same to be flexed inwardly to pass through the necked section of the bottle.

In one embodiment there is provided a first set of members depending upwardly from the cartridge body and a second set of members depending downwardly.

Preferably each of the end portions of the resilient members are angled to substantially the same angle of the wall of the container on which they are to locate. Typically the members are provided with sufficient resilience to exert a pushing force on the walls of the container on which they locate and furthermore the upwardly depending members prevent the cartridge from being removed from the container once the same has been inserted therein.

Preferably the resilient members are moulded as integral parts of the cartridge body.

In a further aspect of the invention there is provided a method for assembling and inserting a cartridge into a container comprising the steps of: placing a first cartridge part into a holder, loading a top cartridge part into the holder, flushing the holder with a gas, joining the top and bottom parts

together to form the cartridge and moving the cartridge into the container.

The flushing of the area with a gas such as nitrogen during the assembly of the parts of the cartridge allows the environment to be maintained in a sterile state and also allows the cartridge to be provided precharged with nitrogen as the pressurised fluid in the chamber. This negates the need for the cartridge to be only usable in cans which are pasteurised and allows the use of nitrogen which is found to give particularly strong foaming effect.

In one embodiment a gas is introduced into the holder prior to the assembly of the parts and said gas acts to charge the cartridge as it is formed and the gas thereby acts as the pressurised fluid. Thus the cartridge is charged during assembly and in one embodiment the gas is nitrogen.

The cartridge can also in one embodiment be pasteurised by hot gas or liquid during the assembly process.

When the cartridge is provided with resilient location members the holder is of a size to maintain the members in an inwardly flexed condition until the cartridge has been placed in the container.

Preferably the method of assembly is part of an automated assembly line and a plurality of holders are moved around a carousel which links with a supply of containers at at least one station to allow the insertion of the formed cartridge into the containers. In one embodiment the aperture in the cartridge is formed by laser drilling and can also, in one embodiment, be drilled in such a manner as to cause the pressurised fluid exiting therethrough to form a vortex around the container to further improve the mixing of the pressurised fluid with the contents of the container.

Specific embodiments of the features of the application are now described with reference to the accompanying drawings wherein;

Figure 1 illustrates an elevation of a first embodiment of a cartridge according to the first aspect of the invention;

Figure 2 illustrates a cross sectional elevation of a second embodiment of a cartridge according to a first aspect of the invention;

Figure 3 is a cross sectional plan view along line AA of the cartridge of Figure 2;

Figure 4 illustrates a cartridge according to a second aspect of the invention in a locating position;

Figure 5 illustrates the cartridge of Figure 4 in a position for placement into a container;

Figure 6 illustrates apparatus for forming an aperture into a cartridge part;

Figure 7 illustrates a schematic diagram of the forming apparatus for forming and loading a cartridge into a container; and

Figure 8 illustrates apparatus for loading the cartridge into the container.

Referring firstly to Figure 1 there is shown a cartridge according to a first aspect of the invention wherein said cartridge 2 comprises a first part 4 connected to a second part 6 to form the cartridge with an inner chamber 8 for the reception of pressurised fluid therein. The chamber 8 is connected via aperture 10 for filling and emptying of pressurised fluid therefrom. The aperture 10 is located in relation to a cavity 12, in this embodiment defined by walls 13, in the chamber which has an opening 16 from the cavity 12 into the chamber 8. Hence any pressurised fluid which enters or leaves the chamber 8 passes through the cavity 12. Figure 2 illustrates a second embodiment of the invention and uses the same reference numerals for the same features and it will be seen in this case that a plurality of apertures 10 are located on the side wall of the cartridge to allow fluid into and from the cavity 12 which in this case is defined by the side wall 14 and an inner wall 15. The cartridge 2 of this embodiment also includes a plurality of resilient members 20 depending upwardly therefrom which are formed as integral parts of the cartridge part 4 thereby preventing the same from becoming loosened from the cartridge and causing choking if swallowed as part of the beverage. The resilient members aid the location of the cartridge and these are discussed in more detail later. To further aid the location of the cartridge 2 location means 22 in the form of a peg is formed in the interior of the container, the base 24 of which is shown in broken lines and onto which indent 26 formed on the cartridge 2 locates to help maintain the cartridge in the desired position in the container.

The cartridge as shown is charged with pressurised fluid and, with the provision of the cavity 12 as shown, as the same is charged with pressurised fluid so the liquid 28 and gas 30 contents of the pressurised fluid separate as shown in Figure 2 where the cartridge is shown in a charged state. Upon discharge the foaming effect created can be controlled and predetermined by the placing of the level of the opening 14 of the cavity which in this case is shown to be near the top of the liquid level. As the pressurised fluid, upon discharge, is required to pass through the cavity and out through the apertures 10 then the liquid 28 which is below the level of the opening 14 is not discharged as it cannot get into the cavity 12. Thus only the liquid 28 above the level of the opening 14 and the gas 30 is discharged and this forms the pressurised fluid discharge. As liquid is known to dilute the foaming effect so the position of the opening 14 can be used to determine the amount of liquid which is discharged and hence the force of the foaming effect.

The discharge of the pressurised fluid is normally obtained when the opening of the container such as a ring pull or screw cap of a bottle is opened thereby causing an increase in pressure differential which is sufficient to cause the pressurised fluid to exit the chamber 8. A further feature of the cartridge of this type is that if the container is a bottle and not all of the beverage is used and the bottle is reclosed the cartridge will recharge with a pressurised fluid so that upon subsequent reopening a further foaming effect is created due to the discharge of pressurised fluid. This recharging effect can be encouraged by shaking or turning over the container.

Referring now to Figures 4 and 5 there is shown a cartridge according to a second aspect of the invention. The Figure 4 illustrates a container 102 formed of plastics PET material and having a necked opening 104 through which the cartridge 106 is required to pass to be located in the bottle. The cartridge 106 is formed from two parts 106a, 106b and when the same are engaged a chamber 108 is formed in which the pressurised fluid is held and the chamber has an aperture 110 which allows fluid to enter and leave the chamber when the pressure differential between the fluid in the chamber and the beverage in the container is sufficiently high. The cartridge 106 also includes a plurality of resilient members 112 which depend outwardly to contact the walls of the container 102 thereby maintaining the cartridge in a fixed position inside the container.

Figure 5 illustrates the cartridge in a position ready for insertion of the same into the bottle through the necked opening 104. Each of the resilient members 112 is pressed inwardly toward the longitudinal axis 114 of the cartridge thereby ensuring that the circumference of the cartridge in this state is less than that of the necked opening 104. The cartridge 106 is placed into the bottle in this state and, once past the neck portion, the members extend toward their normal position as shown in Figure 4. As they do so the members contact the walls of the container and are held in this position pressing against the walls and holding the cartridge in position. Typically the resilient members 112 are formed of plastics material and are formed of shaped outer portions 113 to add to the rigidity of the same and provide an optimum contact interface between the members and the walls of the container.

Referring now to Figures 6, 7 and 8 apparatus for forming a cartridge and charging the same prior to the insertion of the cartridge into a container is shown. In this embodiment the cartridge is formed of two parts and the first stage is to form at least one aperture in one of the parts as shown in Figure 6 wherein a carousel 202 having a plurality of work station 204-214 therearound is provided. At the first station 204 a part is picked up from a hopper 216 and loaded onto the carousel in a holder and the radial orientation of the part is set at station 206 from where the part passes to station 208 where a laser drill 218 is positioned to form the aperture in the part. Once the aperture is formed the part passes to station 210 for a quality test to ensure that the aperture is properly formed and the part is then unloaded to the assembly carousel at station 212 or is rejected at station 214.

Figure 6 shows the cartridge assembly carousel 220 which includes a plurality of work stations 222-232. At station 222 a bottom part of the cartridge is picked up from a hopper 233 and placed in a holder which passes to station 224 where a top part of the cartridge is placed into the holder for assembly which occurs at station 226 where the holder and parts are first flushed with nitrogen and this atmosphere is maintained as the two parts are joined together hence forming a cartridge with a chamber which is precharged with a pressurised fluid in the form of nitrogen. At station 232 the carousel is moved in relation to a bottle supply line 238. The movement of the bottles and the movement of the cartridges is synchronised to allow a cartridge to be placed in each bottle and this position is shown in greater detail in Figure 7 where there is shown a bottle 240 positioned below a holder 242 which contains a completed cartridge therein and, at the same time acts to maintain any resilient members provided in an inwardly flexed position to allow the same to pass through the necked portion of the bottle without snagging on the same. As the cartridge is inserted into the container the area around is maintained in a nitrogen flushed state to prevent leakage from the cartridge and ensure a sterile environment in which the cartridge is placed into the container. The container is then filled and sealed and an equilibrium of pressurised liquid and nitrogen occurs in the cartridge which remains until the container is opened whereupon the pressurised fluid is discharged into the beverage in the container to create the foaming effect in the same.

Claims

1. A cartridge (2) adapted to contain a pressurised fluid in a chamber (8) therein, said cartridge provided for use in a container for a carbonated beverage and adapted for the selected release of the pressurised fluid into the beverage, said cartridge having, in a wall (14) thereof, at least one aperture (10) to allow the entry and/or exit of pressurised fluid into the chamber (8) and characterised in that the aperture (10) opens into a cavity (12) defined by

walls (13;14,15) inside the cartridge (2) and in which there is provided an opening (16) in connection with the chamber (8) of the cartridge.

2. A cartridge according to claim 1 characterised in that the pressurised fluid in the chamber of the cartridge includes a liquid and a gas.

3. A cartridge according to claim 1 characterised in that the opening from the cavity into the chamber is larger than the aperture in the wall of the cartridge.

4. A cartridge according to claim 1 characterised in that the cartridge is substantially cylindrical in shape and the cavity depends substantially from the base of the chamber to extend substantially upwardly from the aperture in the wall so that the pressurised fluid is required to pass through the cavity when entering and exiting the chamber.

5. A cartridge according to any of the preceding claims characterised in that a plurality of apertures are provided in the side walls and/or the base of the cartridge.

6. A cartridge according to claim 5 characterised in that the cavity depends substantially in a direction parallel with the longitudinal axis of the cartridge from apertures provided in the side walls such that the position of the opening from the cavity into the chamber determines the composition of the pressurised fluid emitted from the cartridge in terms of proportion of liquid and gas.

7. A cartridge according to claim 6 characterised in that the position of the opening in the cavity is such that the same lies in the area of the chamber filled with gas only such that the pressurised fluid emitted from the cartridge is gas.

8. A cartridge according to claim 6 characterised in that the opening is positioned such that it lies within the part of the chamber filled with liquid such that the pressurised fluid emitted from the cartridge comprises a mixture of liquid and gas.

9. A cartridge according to any of the preceding claims characterised in that the cavity is defined by a portion of a side wall, a portion of the base of the cartridge, and in one or both of which are formed at least one aperture, and an intermediate wall provided in the chamber and joined to the side wall and base to define the portions thereof and to form the cavity.

10. A cartridge according to any of the preceding claims characterised in that the cartridge is provided with a plurality of resilient members depending outwardly therefrom.

11. A cartridge according to claim 10 characterised in that the resilient members are provided to contact the walls of the container in which the cartridge is placed.

12. A cartridge according to claim 11 characterised in that the container is a bottle and the members are sufficiently flexible to allow the same to be flexed inwardly to pass the same and the cartridge through the necked portion of the bottle.

13. A cartridge according to any of claims 10-12 characterised in that there is provided a first set of members provided to contact the upper walls of the container and a second set adapted to contact with the base of the container.

14. A cartridge according to any of the preceding claims characterised in that the cartridge and container are provided with location means which when brought into engagement locate the cartridge on in the container.

15. A cartridge according to any of the preceding claims characterised in that the chamber or cavity of the cartridge includes a substance inserted prior to the pressurised fluid which colours and/ or flavours the beverage when introduced into the beverage along with the pressurised fluid.

16. A cartridge according to any of the preceding claims characterised in that the cartridge is formed from two parts, one of which includes the cavity depending in relation with at least one aperture formed in the wall of the same.

17. A cartridge according to any of the preceding claims characterised in that the cartridge can be reused to hold a plurality of successive charges of pressurised fluid.

18. A cartridge according to any of the preceding claims characterised in that the at least one exit aperture for the pressurised fluid from the cartridge into the container is initially sealed in a closed position.

19. A cartridge according to claim 18 characterised in that the at least one aperture is sealed by a release membrane of a gelatine base substance.

20. A cartridge according to claim 18 characterised in that the at least one aperture is sealed by a valve assembly provided in the cartridge which is openable when the pressured differential between the pressurised fluid and the beverage in the container increases.

21. A cartridge (106) adapted to contain a pressurised fluid, said cartridge provided in the interior of a container (102) for a carbonated beverage and said cartridge adapted for the selected release of the pressurised fluid into the beverage from an interior chamber (108) through an aperture (110) and characterised in that the cartridge (106) is provided with a plurality of resilient members (112) depending therefrom such that when the cartridge (106) is placed in the container (102) the resilient members (112) contact with the walls of the container (102) to maintain the cartridge (106) in the desired position therein.

22. A cartridge according to claim 21 characterised in that the container is a bottle with a necked opening and the members are sufficiently flexible and resilient to allow the same to be flexed inwardly to pass through the necked section of the bottle.

23. A cartridge according to claim 21 characterised in that a first set of members depend in a general first direction away from the cartridge and a second set of members depend in a second general direction away from the cartridge.

24. A cartridge according to any of claims 21-23 characterised in that each of the end portions of the resilient members are angled to substantially the same angle of the wall of the container on which they are to locate.

25. A cartridge according to any of claims 21-24 characterised in that the members are provided with sufficient resilience to exert a pushing force on the walls of the container on which they locate.

26. A cartridge according to any of claims 21-25 characterised in that the members are formed as integral parts of the cartridge body.

27. A method for assembling and inserting a cartridge formed from at least two parts into a container comprising the steps of: placing a first cartridge part into a holder, loading a second cartridge part into the holder, flushing the holder with a gas, joining the top and bottom parts together to form the cartridge and moving the cartridge into the container.

28. A method according to claim 27 characterised in that the gas is introduced into the holder prior to the assembly of the parts and said gas acts to charge the cartridge as it is formed and the gas thereby acts as the pressurised fluid.

29. A method according to claim 27 or 28 characterised in that the gas is nitrogen.

30. A method according to claim 27 characterised in that the cartridge is pasteurised prior to insertion into the container.

31. A method according to claim 27 characterised in that the cartridge is provided with resilient location members and the holder is of a size to maintain the members in an inwardly flexed condition until the cartridge has been placed in the container.

32. A method according to claim 27 characterised in that the at least one aperture in the cartridge is formed by laser drilling.

33. A method according to claim 32 characterised in that the at least one aperture in the cartridge is drilled in a manner to cause the pressurised fluid to create a vortex upon exit into the beverage in the container.

34. A method according to any of claims 27-33 characterised in that the method is part of an automated assembly line and a plurality of holders are moved around a carousel which links with a supply of containers at at least one station to allow the insertion of the formed cartridge into the containers.

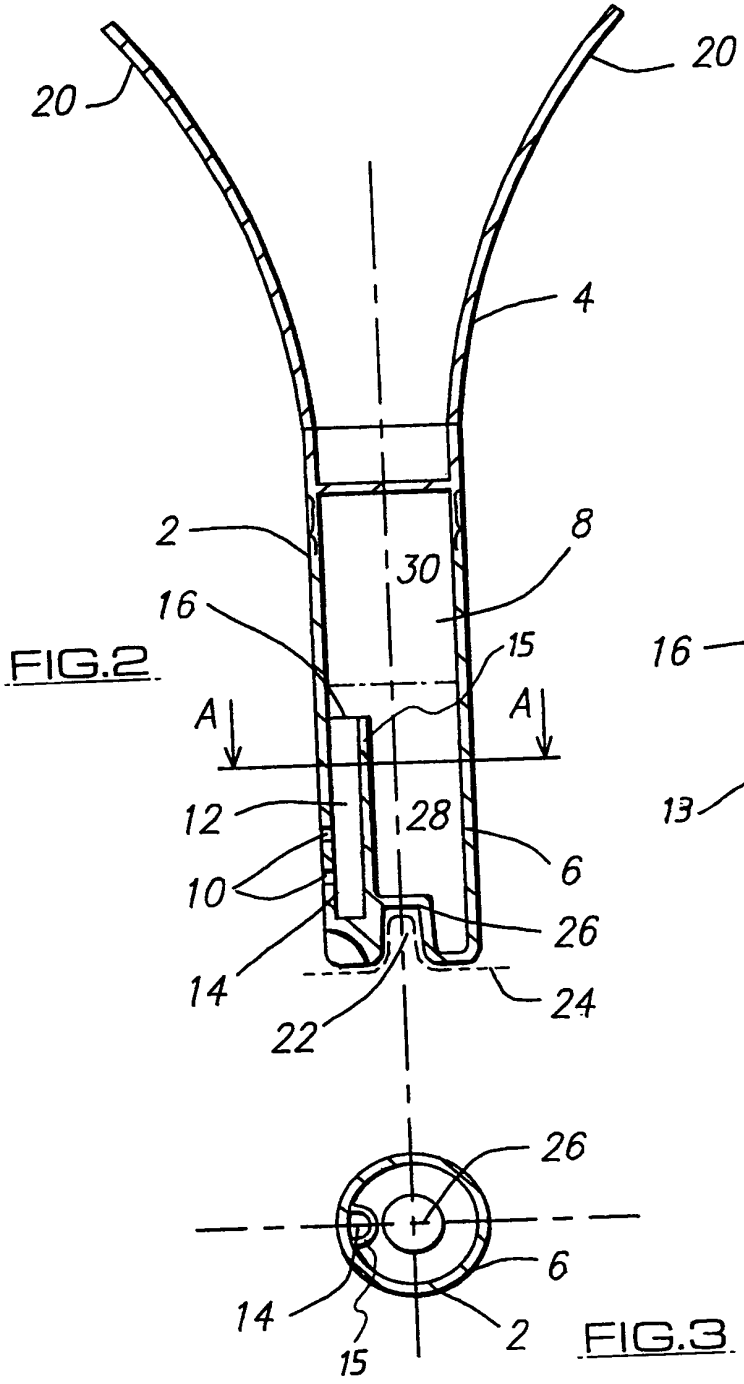

FIG.2

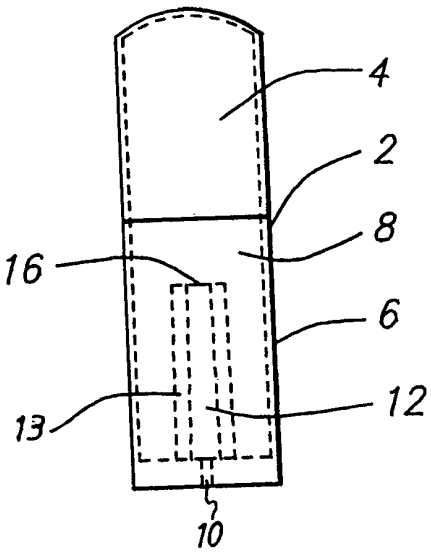

FIG.1

FIG.3

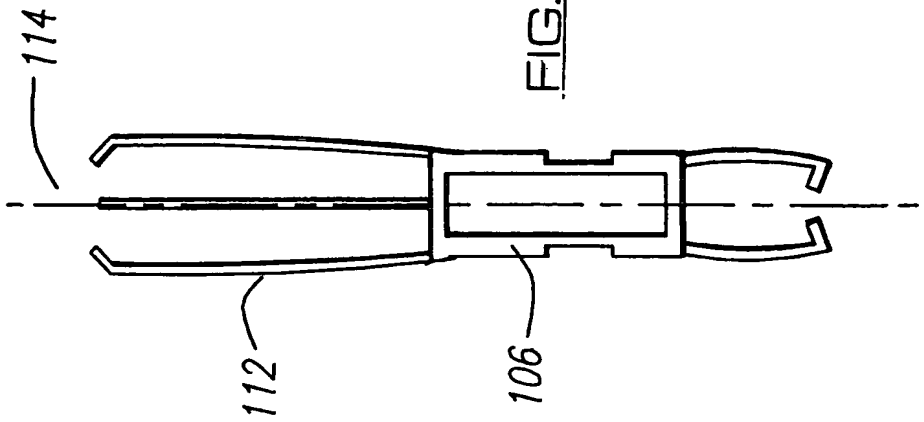

FIG.5

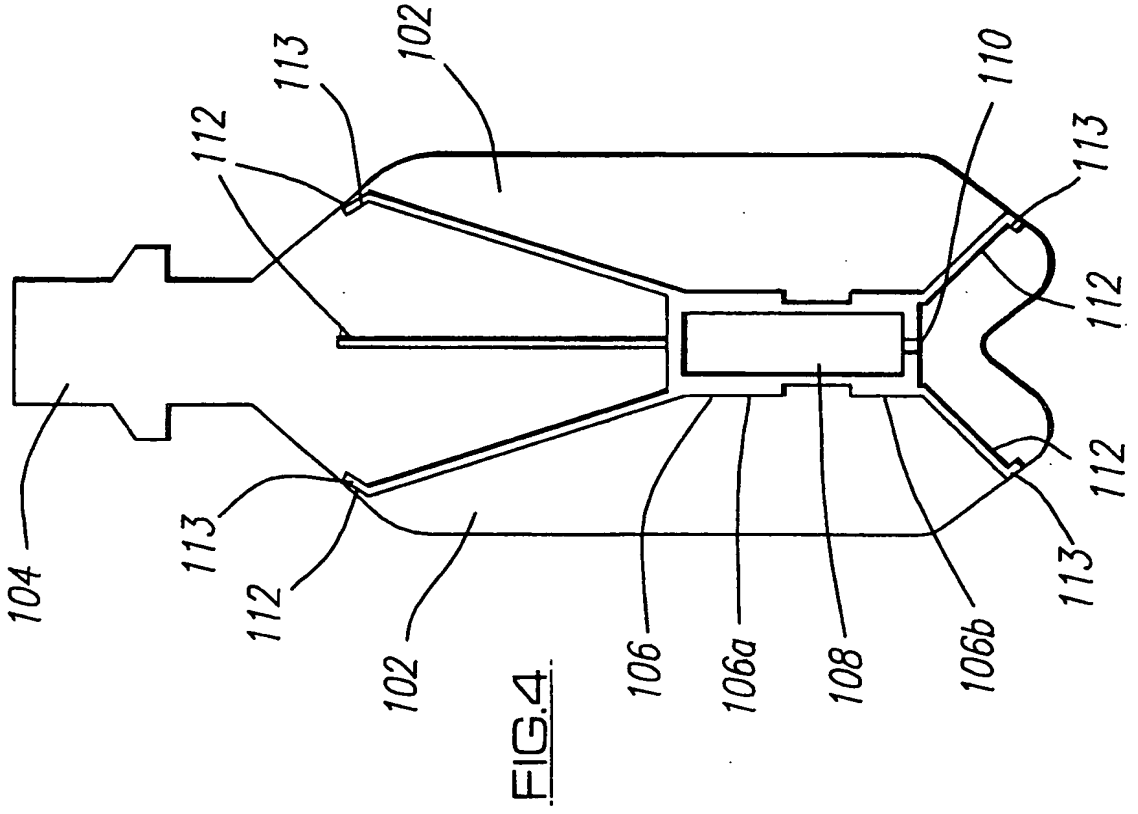

FIG.4

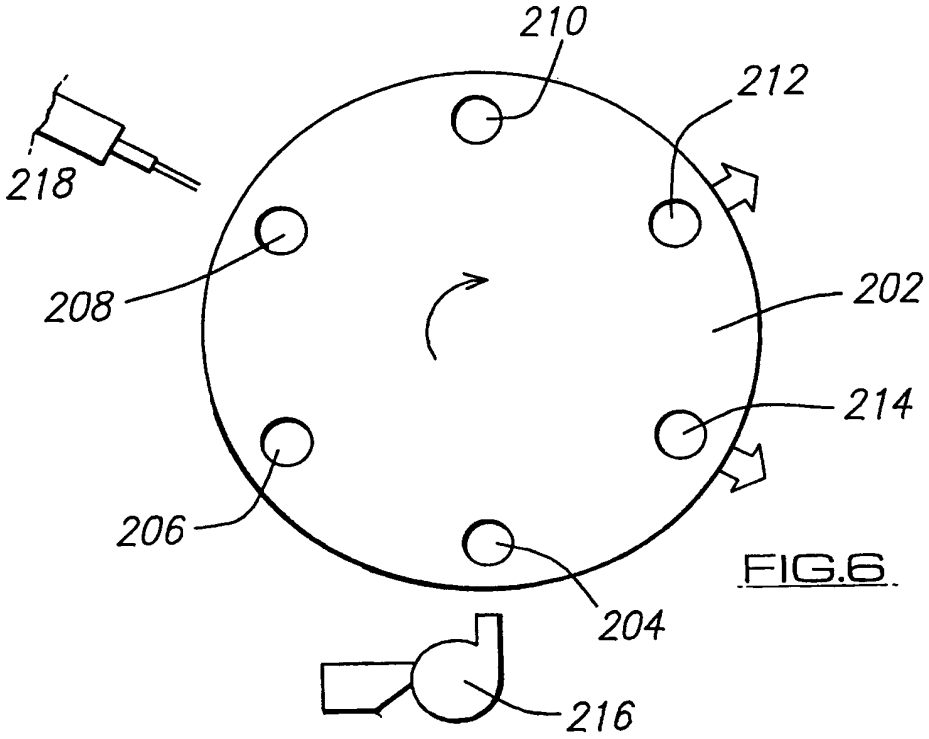

FIG.6

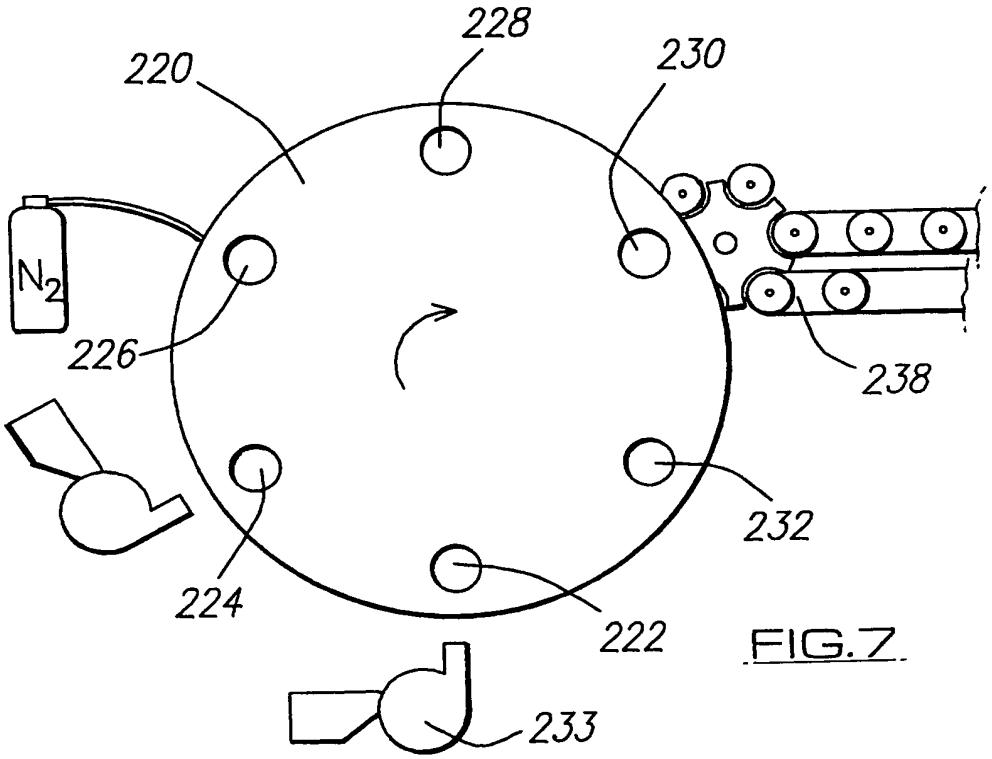

FIG.7

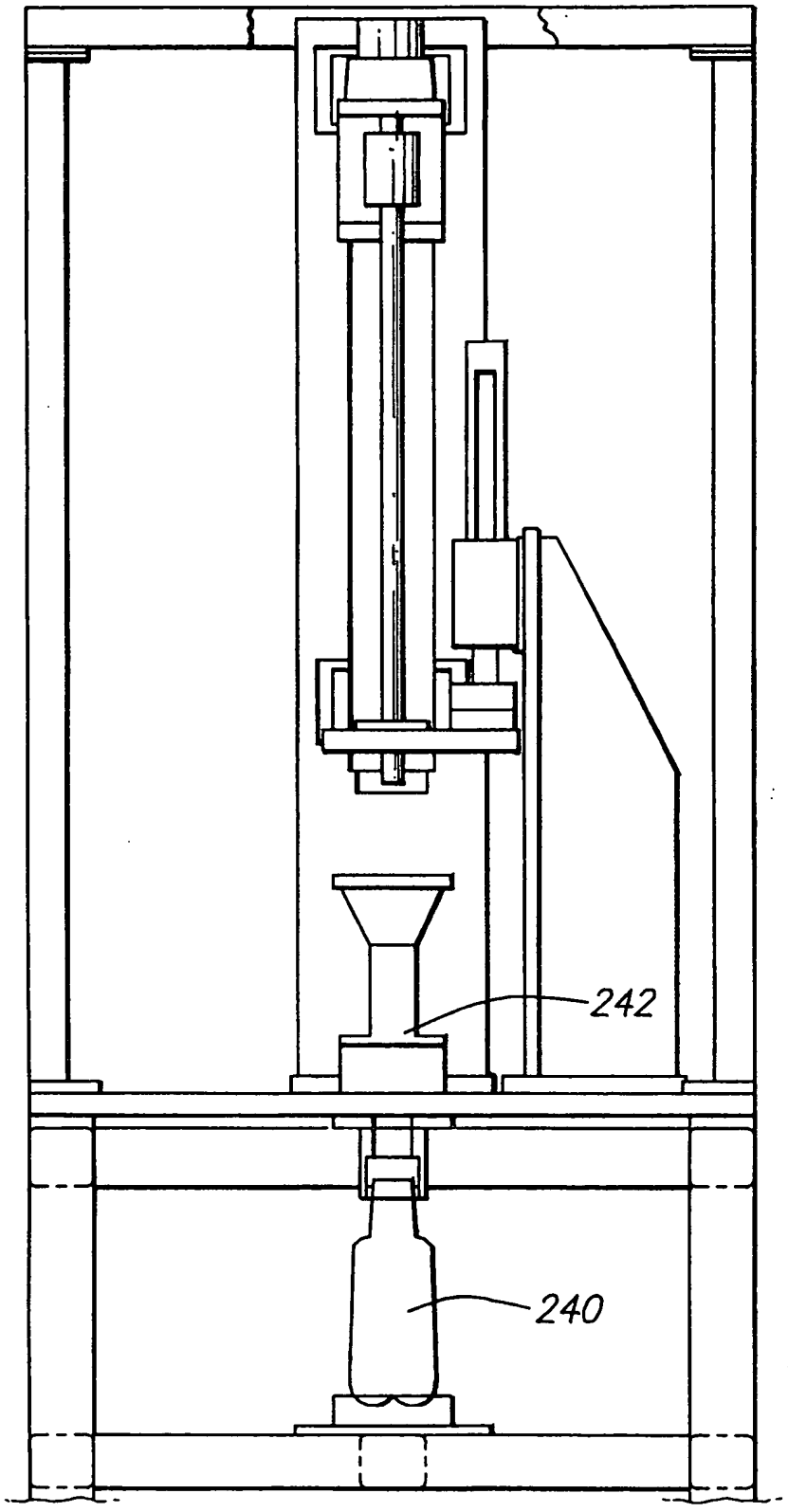

FIG.8